

- Sub B1
- (A) dissolved zinc cations;
- (B) dissolved phosphate anions, and
- (C) at least one dissolved auxiliary acid other than phosphoric acid, said auxiliary acid having at least a first ionization constant that is greater than the third ionization constant for phosphoric acid; and, optionally, other constituents as detailed further below,

A

this aqueous electrolyte also being in contact with a counter-electrode that is not said metal substrate to be cold worked, so that an electric current can pass through the counter-electrode as anode, the aqueous electrolyte solution by ionic conduction, and said metal substrate as cathode;

- (II) passing through said metal substrate while it remains in contact with said aqueous electrolyte solution an electric current that has a net cathodizing character at said metal substrate for a sufficient time to form an adherent solid phosphate conversion coating over said metal substrate;
- (III) discontinuing contact between said aqueous electrolyte solution and said metal substrate bearing said adherent solid phosphate conversion coating; and
- (IV) applying to the exterior surface of said solid phosphate conversion coating, when it is not in contact with said aqueous electrolyte solution, a water- or oil-based lubricant coating;

wherein said aqueous electrolyte solution in operation (I):

comprises at least 20 g/l of dissolved zinc cations and at least 20 g/l of dissolved phosphate anions; and

has a pH value at least as low as the pH value of a hypothetical reference electrolyte solution that contains the same actual amounts of dissolved zinc and phosphate ions as does said aqueous electrolyte solution and in addition contains at least 30 g/l of nitric acid as its only auxiliary acid.

Please cancel claim 2.

Please add claims 22-24 as follows:

22. ~~[(New)]~~ A process for forming a lubricative film for cold working on a metal substrate, the process comprising the following operations:

- A2*  
*Sub E3*
- (I) bringing the metal substrate into contact with an aqueous electrolyte solution comprising water and;
    - (A) dissolved zinc cations;
    - (B) dissolved phosphate anions; and
    - (C) at least one dissolved auxiliary acid other than phosphoric acid, the auxiliary acid being present in an amount of at least 30 g/l and having at least a first ionization constant that is greater than the third ionization constant for phosphoric acid; and, optionally, other constituents as detailed further below,this aqueous electrolyte also being in contact with a counter-electrode that is not the metal substrate to be cold worked, so that an electric current can pass through the counter-electrode as anode, the aqueous electrolyte solution by ionic conduction, and the metal substrate as cathode;
  - (II) passing through the metal substrate while it remains in contact with the aqueous electrolyte solution an electric current that has a net cathodizing character at the metal substrate for a sufficient time to form an adherent solid phosphate conversion coating over the metal substrate;
  - (III) discontinuing contact between the aqueous electrolyte solution and the metal substrate bearing the adherent solid phosphate conversion coating; and
  - (IV) applying to the exterior surface of the solid phosphate conversion coating, when it is not in contact with the aqueous electrolyte solution, a water- or oil-based lubricant coating.

23. ~~[(New)]~~ A process according to claim 22 wherein the auxiliary acid is nitric acid.

A-Sub E4 24. [New] A process according to claim 23 wherein the aqueous electrolyte solution in operation (I) comprises at least 20 g/l of dissolved zinc cations and at least 20 g/l of dissolved phosphate anions.

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